a novel one. But the two groups of phenomena, and the processes involved in each, are still very frequently confounded in other domains than that of use inheritance. The whole eugenics movement, for instance, so far as it is a constructive program and not a mere matter of ordinary practical prophylactic social hygiene, rests upon the assumption that social progress can best be accomplished by organic means. It may be rash to deny wholly that such an end can be achieved in this way or that it would be useful. But the orthodox eugenist, from the time of the founder Galton, has consistently and complacently made this assumption without any inquiry as to its justification. Lamarck erected a false doctrine of evolution through explaining the organic in terms of the social, or in terms derived by mere analogy from the social. The eugenists of to-day, it may fairly be suggested, bid fair to vitiate a movement that springs from the most sincere of motives, by resting its basis on an interpretation of the social as merely organic.

In summary, the doctrine of the hereditary transmission of acquired characters is no more disprovable than it is provable by accumulation and analysis of evidence. It springs from a naïve, unscientific, and even primitive method of reasoning by analogy, which in this case works to a confusion of the long-distinguished and necessarily distinct concepts of the organic and the social. The doctrine must therefore be dismissed on purely methodological grounds. It is possible that when the missing factor or element of evolution is discovered that neither Darwin nor the mutationists have been able to find, this factor will prove to be something superficially similar to use inheritance. But it will differ from the present only half-discredited but discreditable factor of heredity by acquirement, in containing an organic mechanism, and will therefore be essentially different from this crude and confused assumption.

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TRIFOLIUM PRATENSE QUINQUEFOLIUM

HUGO DE VRIES in his mutation theory tells us in detail about his production, by means of selection from two mutant forms, of a five-leaved race of red clover. This race he called *Trifolium pratense quinquefolium*. The two plants obtained for starting

his selection were found, according to the author, growing near the edge of a road that was covered with grass. He does not tell us the exact composition of all the leaves of these two plants with which he started, but states that they bore several tetramerous and one pentamerous leaf. Neither of the plants, therefore, could be called mutants of a new race, but were mutating forms from which De Vries obtained, after a process of most rigid selection, his highly variable race, *Trifolium pratense quinquefolium.*

During the spring of 1914, I found growing in an old orchard at Corvallis, Oregon, a red clover plant that showed "full-fledged" all the characters of *Trifolium pratense quinquefolium* about which De Vries has written, and which took him so long to obtain by the aid of selection. This clover plant, after careful examination, was transplanted in one of my experimental plots for further study. The following descriptive notes of it are given: Of medium height; good color; normal as to vigor, but not luxuriant; seven stalks; leaves, 4 trimerous, 5 tetramerous, 12 pentamerous; total number of leaves, 21. Not only did the pentamerous condition of so many leaves represent the mode for leaf variation, but there were more five-leaved leaves than both four-leaved and three-leaved leaves combined.

The magnitude of this mutation may be more fully appreciated when we reflect that De Vries, after selecting for three generations and obtaining 300 plants, found only one that gave as high a percentage as 36 for both tetra- and pentamerous leaves; while the percentage of tetra- and pentamerous leaves for all those counted, 8,366, was only 14.

After finding this specimen of *Trifolium pratense quinquefolium* I was exceedingly desirous of obtaining another plant with which to cross fertilize it so as to obtain a race which could be used commercially, but repeated searches made for many days failed to reveal any other plant suitable to cross with this one. Thus failing to find a second plant, I decided to propagate the discovered mutant vegetatively. This method gave some degree of success, and a few plants were reared during the summer of 1914 from slips. When I left Oregon at the end of the summer, four of these plants were transferred to a private lot, and a railing, supported by stakes, was put around them.

Examination on June 3 the following summer (1915) showed two of these slips doing well, one had been trampled on and

killed by a cow, and the other was dead. At this time I still had hopes of obtaining a race of five-leaved red clover, but when I returned to Oregon and examined these plants on June 20 all such hopes vanished, for a neighbor's cow had completely ruined them, cropping off all the stalks down to the ground. None of the plants revived after this last injury.

Records for the leaf production of this mutant were kept, and from them I have obtained the following: On May 11, 1914, a count was made of all the leaves produced up to date. There had been produced 6 trimerous, 7 tetramerous and 17 pentamerous leaves; 30 in all, over 56 per cent. pentamerous. We notice, however, a slight decline in the percentage of pentamerous leaves produced, since the plant was found. This decline, early noticed, continued throughout the summer, and on August 23, when I made my last leaf counts, I obtained the following record of leaf production for this mutant clover plant:

	Trimerous Leaves	Tetramerous Leaves	Pentamerous Leaves
Leaves on plant when found	4	5	12
Leaves produced since plant was found	30	11	17
Total leaves produced by plant	34	16	29

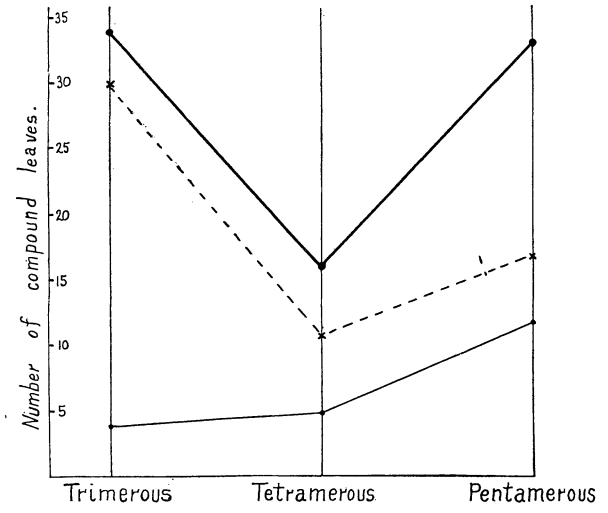

FIG. 1. Frequency polygon showing leaf variations of a mutant individual of *Trifolium pratense quinquefolium*. Light solid line shows variations of leaves on plant when discovered; dotted line, variations in leaves produced by plant in captivity; heavy solid line, variations for all leaves produced by mutant plant and its slip plant descendants.

How are we to interpret these results? Why should there be such a preponderance of pentamerous leaves produced during the early growth period of the plant, then a preponderance of trimerous leaves during the latter part of the season?

The records obtained for 1915 for the slip plants added but little to the 1914 records. The leaf production of slip plant No. 3, however, is interesting. In 1914 this slip plant produced 4 trimerous, 2 tetramerous and 4 pentamerous leaves. In 1915, however, it produced 0 trimerous, 0 tetramerous and 4 pentamerous leaves—showing strongly the inherited tendency to produce the pentamerous leaves during the second season. Clover heads were produced during the summer of 1914, but no seed was found in them.

No leaves were produced by this plant having more than five leaflets, a condition that obtained during the first three generations of De Vries's race, yet later he obtained both 6- and 7-merous leaves in abundance. A frequency polygon is plotted (see figure) for the leaf variations of this red clover mutant.

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